**UNITED STATES ENVIROMENTAL PROTECTION AGENCY**
**REGION 5**
**77 WEST JACKSON BOULEVARD**
**CHICAGO. IL 60604-3590**

REPLY TO THE ATTENTION OF
SR-6J

**MEMORANDUM**

**DATE:** MAY 21 1999

**SUBJECT:** National Remedy Review Board Recommendations for the Sheboygan River and Harbor Superfund Site

**FROM:** William E. Muno, Director
Superfund Division

**To:** Bruce K. Means, Chair
National Remedy Review Board

Purpose

Region 5 appreciates the time spent by the National Remedy Review Board (NRRB) and thanks them for their recommendations and comments for the Sheboygan River and Harbor Superfund site. The State also appreciates its opportunity to present information to the Board and remains in general concurrence with the recommended alternatives. The board's comments and this response will be part of the Administrative Record for the site.

**NRRB Comment #1**

The board notes that potentially responsible party (PRP) technical comments were provided to the NRRB only shortly before the NRRB meeting. While there was little time for the EPA to evaluate fully these comments prior to the board's discussion, among them was an issue of particular interest. The PRP argues that based on the estimated time required to implement the region's, preferred alternative (3-IV-A), and the "estimated half-life of PCBs in the upper river," there are few advantages in selecting the preferred alternative over the significantly less expensive alternative 3-II. The PRP analysis predicts these two alternatives will achieve the same target surface weighted average concentration (SWAC) over the upper river in similar time frames. The PRP argues further that dredging to a level of 2.6 ppm PCBs (alternative 3-II) will achieve the SWAC goal in 31 years, while EPA's proposal to dredge to 1.0 ppm PCBs (alternative 3-IV-A) is predicted to achieve the SWAC goal in 27 years. The board recommends that the region fully consider this analysis and supporting assumptions prior to identifying a preferred alternative.

**Region 5 Response to NRRB Comment #1**

We have fully considered the analysis and supporting assumptions made by the PRPs in its projection of achieving an overall river SWAC goal of 1.0 ppm PCBs in 31 years or 27 years depending on whether you remediate soft sediments to a PCB SWAC of 2.6 ppm (alternative 3-II) or 1.0 ppm (alternative 3-IV-A). The use of SWAC is very sensitive to changes in two primary variables; the soft sediment vs. non-soft sediment ratio and PCB half-life.

Soft Sediment / Non-Soft Sediment Weighting

We analyzed the effect of various soft sediment vs. non-soft sediment ratios. The PRP's SWAC analysis uses a 15% soft sediment / 85% non-soft sediment ratio based on the actual surface area of the river. Based on investigations in the upper river, approximately 15% of the upper river basin contains soft sediment deposits while the remaining 85% of the river basin consists of rocks, cobbles, etc. The PRP use the 15% / 85% ratio to represent the amount of time the aquatic receptors spend over soft and non-soft sediment areas and consequently the proportionate time aquatic receptors are exposed to PCB contamination.

To calculate an overall Upper River SWAC, you need to establish a PCB concentration for non-soft sediment areas. In 1997, the State of Wisconsin took samples, averaging 2.5 ppm, in river bed areas not containing soft sediments. These samples were collected from the top 5 to 10 cm of river bed which included river bed areas under rocks and cobbles. Although fish would generally not be exposed to these contaminated areas, micro-organisms and other lower food chain receptors would be exposed to the PCB contamination thus introducing it into the food chain. In addition, seasonal flood events will cause rocks and cobbles to move and expose the PCB contamination previously covered.

**Summary of SWAC Analysis**

| | Overall River SWAC Based on Post-Remediation Soft Sediment SWAC of | |
|---|---|---|
| Soft Sediment vs Non-Soft Sediment Weighting | 2.6 ppm | 1.0 ppm |
| 15% / 85% | 2.52 | 2.28 |
| 25% / 75% | 2.53 | 2.13 |
| 50% / 50% | 2.55 | 1.75 |
| 75% / 25% | 2.58 | 1.38 |
| 85% / 15% | 2.59 | 1.23 |

**Table 1**

As seen in Table 1, varying the soft sediment and non-soft sediment SWAC ratio using the PRP target of 2.6 ppm and EPA target of 1.0 ppm results in some significant differences in overall river SWAC. The greater the percentage of soft sediments, the

greater the impact by remediating soft sediments. The PRP has recently submitted information that describes habitat preferences for smallmouth bass. one of the analyzed aquatic receptors. According to the literature presented by the PRP, smallmouth bass prefer rocky / gravel areas over soft substrate which they believe supports their use of the 15% / 85% weighting. While this may be true for smallmouth bass, bass are only one of the many aquatic receptors impacted by the PCBs in the river.We believe that a 15% / 85% weighting is not indicative of PCB exposure for all the aquatic receptors and it is clear from Table 1 that SWAC is very sensitive to the relative weighting of the soft and non-soft sediment areas. Also, as described below, the NOAA analysis confirmed that soft sediments were redistributed in the river system which argues that the 15% / 85% weighting may not currently be representative.

PCB Half-Life Analysis

The second primary variable in assessing the amount of time it takes for the river to reach an overall SWAC of 1.0 ppm is PCB half-life. The PRP PCB half-life analysis represents the time contamination concentrations at a give location will decline by 50 percent. This represents a "lumped parameter estimate" which includes all processes associated with natural attenuation (e.g., migration, mixing, burial, biodegradation, etc.) and is not solely representative of biodegradation. In other words, the recovery rate or calculated half-life takes into consideration all the natural processes that have occurred over the time frame when the comparison was conducted. In the case of the Upper River, that comparison was over 8-10 years (1987/9 to 1997). The PRP PCB half-life analysis determined that it took any where from approximately 1 year to 23 years, averaging 8 years, for PCB contaminated sediment concentrations to reduce by 50%.

This variability in the length of PCB half-life can have a profound effect on river recovery when combined with the variability associated with SWAC. As can be seen in Table 2, even considering the extra time to implement a more comprehensive removal remedy, if PCB half-lives are nearer the maximum, even using a 50%/50% SWAC ratio the EPA recommended alternative 3-IV-A, targeting a clean up goal of 1.0 ppm,reduces the overall river recovery time by over 20% or from 34.2 years to 26.7 years.
The PRP PCB half-life analysis represents the time for *surficial sediment* (from the top 6 inches) to decline by 50 percent. The PRP assertion is that entire deposits do not shift,

**Summary of SWAC and PCB Half-Life Analysis**

| | Years to Reach Overall River SWAC of 1.0 ppm Based on Post-Remediation Soft Sediment SWAC and Min/Max PCB Half-Life | |
|---|---|---|
| Soft Sediment vs. Non-Soft Sediment Weighting | Att. 3-II 2.6 ppm | Att. 3-IV-A 1.0 ppm |
| 15% / 85% | 4 7 to 33.8 | 9.5 to 35.5 |
| 25% / 75% | 4.7 to 33.9 | 9.4 to 33.2 |
| 50% / 150% | 4.7 to 34 2 | 9.0 to 26.7 |
| 75% / 25% | 47to346 | 8.6 to187 |
| 85% / 15% | 4 7 to 34 7 | 8.4 to 14 9 |

**Table 2**

(i.e., they do not move as a unit) and when scour takes place, the sediment that is scoured (and combined with clean sediment entering the River system from upstream), is deposited downstream, and therefore represents a mix of all sediment traveling in the River. The idea that only the top six inches of contaminated soft sediments will ever be effected by scouring and mixing seems implausible. During sediment investigations conducted as part of the NOAA Aquatic Risk Assessment in July and August of 1997, NOAA and Wisconsin DNR staff observed that soft sediment deposits had significantly shifted and/or had been disturbed in the upper river.

The greater the volume of PCB contaminated sediment left in the river, the greater the likelihood is that over time that these buried sediments will be exposed. This will lengthen the overall river recovery time. Based on a review of the sensitivity and variability in SWAC and the PCB half-life analysis, alternative 3-IV-A is a more appropriate remedy selection given the actual river conditions under this type of analysis.

**NRRB Comment #2**

With respect to the alternatives that address the remaining upper river soft sediments, the board notes that there is a significant cost increase ($7 million) between alternative 3-IV and alternative 3-IV-A for a relatively small incremental reduction in residual PCB concentrations in sediments (i.e., 1.5 vs. 1.0). Given the stated uncertainties in the fate/transport and risk assessment model results, the region should better justify its selection of alternative 3-IV-A in supporting decision documents.

**Region 5 Response to Comment #2**

The risk numbers calculated for the site and presented at the March 11$^{th}$ meeting did not include the impact of the more highly toxic PCB congeners present in the system; thus, they ***under***estimate risks at the site. The target sediment goal of 1.0 ppm equates to a human health risk of $7.0 \times 10^{-5}$. Achievement of just the middle of the human health range, $1.0 \times 10^{-5}$, would require a target sediment cleanup goal of 0.15 ppm. To achieve a cleanup goal of 0.15 ppm, approximately 97% of the remaining soft sediment in the upper river must be removed. Table 3, on the following page, shows how human health risk levels, fish tissue levels, and soft sediment cleanup goals are related. Inclusion of the more highly toxic PCB congeners would have resulted in an even lower recommended sediment cleanup goal to meet the same fish tissue and risk levels.

In addition, the target sediment clean up goal of 1.0 ppm represented the maximum end of the Lowest Observable Adverse Effect Level (LOAEL) for the aquatic receptors analyzed in the NOAA assessment. Acceptance of this target goal, by EPA, acknowledges some remaining adverse impacts to the aquatic receptors. Removing all adverse effects for the most sensitive aquatic receptors would have resulted in a target sediment cleanup goal of at least 0.7 ppm.

The more mass removed from the system, the more likely the target SWAC goals will be achieved in the shortest period of time. Any PCB mass remaining in the ystem will act as a continuing source available to the biota. This is particularly important in the Upper River where soft sediment deposits are likely to be significantly effected by seasonal flood eventsand other riverbed disturbances.

| Human Health Risk Summary | | |
|---|---|---|
| Risk Level | Fish Tissue Level (ppm) | Sediment Surface Cleanup Goal (ppm) |
| $2 \times 10^{-4}$ | 1.7* | 2.6 |
| $1 \times 10^{-4}$ | 1.0 | 1.5 |
| $7 \times 10^{-5}$ | 0.7 | 1.0 |
| $1 \times 10^{-5}$ | 0.09 | 0.15 |
| $1 \times 10^{-6}$ | 0.009 | 0.015 |

* 1.7 ppm fish tissue level is not recommended as it would likely result in fish that would not meet fish advisory levels.

**Table 3**

Given that the target soft sediment clean up goal of 1.0 ppm does not include the impact of the more highly toxic PCB congeners and acknowledges remaining adverse impact to the aquatic receptors, what appears to be a relatively small incremental reduction in PCB sediment concentration levels, between Alternative 3-IV and 3-IV-A, continues to demonstrate steady reductions in SWAC, and consequently risk, as seen in Figure 1 on the following page. In moving from Alternative 3-1V to 3-IV-A an additional 9% of the PCB mass is removed, which is not insignificant, while at the same time the SWAC is reduced by 47%, which is a very significant reduction. Therefore, Alternative 3-IV-A remains a cost effective alternative.

**NRRB Comment #3**

Based on the regional presentation and discussion on the range of alternatives considered for the upper river, there remain questions about how the costs, residual risks, and cleanup time frames compare among the alternatives. The region should more thoroughly evaluate how these factors change among alternatives to help identify appropriate mass removal andlor SWAC targets. The sensitivity of key assumptions important to the analysis of each factor should also be evaluated.

**Region 5 Response to NRRB Comment #3**

As seen in Figure 1, as you move through the soft sediment removal alternatives, you gradually remove more of the remaining PCB mass with increases in cost. The PRP's preferred alternative 3-II removes approximately 68% of the remaining PCB mass in the Upper River at a cost of approximately $15,600,000. There continues to be a substantial increase in PCB mass removal between alternatives 3-II and 3-IV with alternative 3-IV removing approximately 85% of the remaining PCB mass at a cost of $23,800,000. As you move beyond alternative 3-IV the rate of PCB mass removed gradually decreases and begins to level off between 93% and 96%. However, reductions in SWAC, and therefore risk, continue to decrease steadily until approximately 97% of the remaining mass is removed from the system.

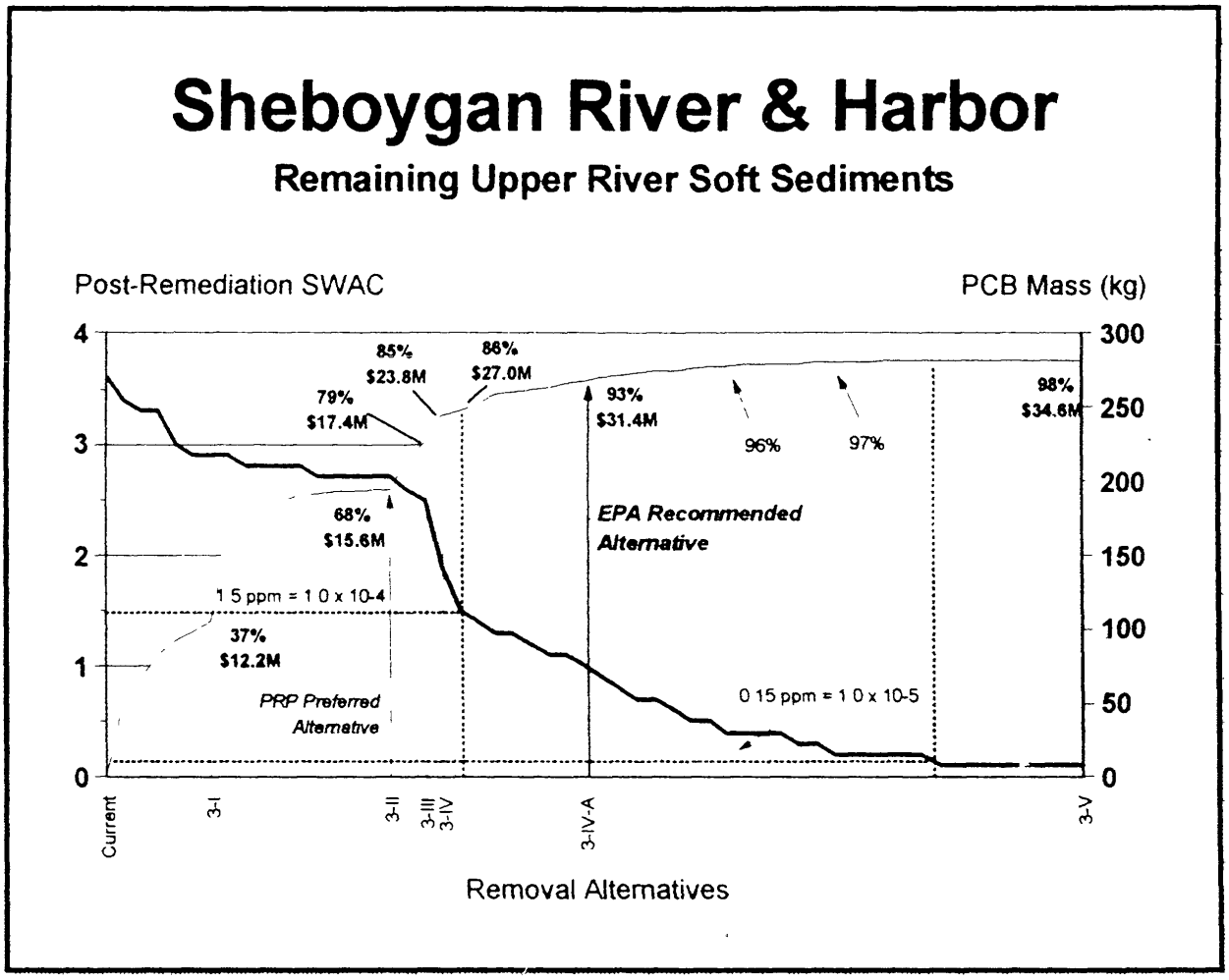


**Figure 1**

Figure 1 also shows how the various alternatives compare to the $1.0 \times 10^{-4}$ and $1.0 \times 10^{-5}$ risk levels. The PRP preferred alternative 3-II, does not meet the $1.0 \times 10^{-4}$ risk level for soft sediments.

As is described in the response to NRRB Comment #1, achievement of an overall river PCB SWAC of 1.0 ppm is highly sensitive to changes in soft sediment and non-soft sediment SWAC ratios and variances in PCB half-life timeframes. These factors are directly impacted by the amount of remaining PCB mass left in the river system. Given the uncertainty with SWAC and the PCB half-life analysis, the bio-available threat of remaining contaminated sediment, the under-represented human health risks, and the remaining adverse impacts to aquatic receptors, the soft sediment PCB SWAC target of 1.0 ppm will reasonably achieve a risk management target of $7.0 \times 10^{-5}$. The PRP soft sediment PCB SWAC target of 2.6 ppm, results in a risk level of $2.0 \times 10^{-4}$ and does not satisfy the threshold criteria of protection of human health and the environment for soft sediments.

**NRRB Comment #4**

The regional presentation indicated that the PRPs believe there may a continuing source of PCB contamination to the upper river, and that additional work is underway to further assess this potential. The board recommends the region include a discussion of the strategy to address this potential contamination (should it be identified) in the proposed plan for the site.

**Region 5 Response to NRRB Comment #4**

Subsequent to the March 1999 RRB meeting and in advance of the Record of Decision for this site, the PRPs have initiated source identification activities in the Upper River. A recent river bank sample near a Tecumseh facility non-contact discharge pipe showed a PCB concentration of 2,700 ppm. The duplicate sample showed a concentration of 4,400 ppm. This data that has yet to go through quality assurance but if verified, may indicate a continuing source to the river. The Proposed Plan will discuss the strategy for addressing the possible continued PCB sourcing of the Upper River.

**NRRB Comment #5**

The regional presentation also indicated that PCB source material near the Tecumseh facility may have contaminated groundwater in the upper river area, and yet provided little information about how the proposed (or future) remedial actions would address such contamination. With this in mind, the region should clarify how the proposed (or future) actions for the Upper River are consistent with the NCP, and how they consider the Agency's guidance on groundwater remediation (i.e., Presumptive Response Strategy and Ex-Situ Treatment Technologies for Contaminated Ground Water at CERCLA Sites; OSWER Directive 9283.1-12).

**Region 5 Response to NRRB Comment #5**

While we are proposing to conduct further groundwater investigations, the PRPs have initiated this effort prior to the Record of Decision. This effort may better quantify groundwater flux to the river and the extent of groundwater contamination at the facility. However, consistent with the NCP and the Agency's policy on groundwater, if groundwater investigations determine that an active treatment remedy is necessary, Alternative 3, Collection Trench and Treatment, will be selected.

**NRRB Comment #6**

The region should clarify in its decision documents the rationale for actions related to the middle river. The material presented was not clear as to which portions of the remedy were related to long term whole river biological monitoring and which were related to delineating any contaminated sediment in the middle river, which may still need to be addressed (if practicable). Further, the decision documents should discuss in detail the additional actions being considered for middle river sediments with elevated levels of PCBs (should they be found) and the appropriate triggers for action.

**Region 5 Response to Comment #6**

The region acknowledges the apparent lack of clarity in the RRB materials related to the Middle River. The RRB materials stated that the Middle River Delineation & Monitoring Alternative was approximately $1.8 million. This is made up approximately $1.3 million for long-term biological monitoring ($100,000/year for 30 years using a discount rate of 7%) and $0.5 million for additional sediment sampling. The U.S. EPA, Natural Resource Trustees, and the State are working together to determine the appropriate triggers for action should elevated levels of PCB be found. These triggers will be delineated in the Record of Decision for the site. If contaminated sediment deposits are found that exceed these action triggers, the removal of these deposits will be included in remedial action.

**NRRB Comment #7**

The region proposes constructing a sediment trap in the lower river at a cost of $13 million ($16 million with monitoring and harbor break wall maintenance) as part of the preferred alternative. No information was provided to identify the effectiveness of the trap in capturing PCB contaminated sediments. Without this information, the value of this portion of the remedy is not clear. The region should characterize the PCB mass removal efficiency of the trap, estimate the resulting human health and environmental risk reduction, and better evaluate the cost effectiveness of this portion of the remedy. The results of these analyses should be discussed in the site decision documents.

**Region 5 Response to NRRB Comment #7**

The US Army Corps of Engineers is finalizing the capture efficiency of the proposed trap, but preliminary results show approximately 10% to 30% of the total incoming courser silts will be captured and approximately 5% - 20% of the finer silts and clays will be captured in the sediment trap. It is also anticipated that PCBs will predominantly attach themselves to the finer silts making the PCB capture efficiency insufficient to continue to recommend this alternative. This analysis and information will be place in the Administrative Record for the site.

However, since the March 1999 RRB meeting and concurrent with the sediment trap analysis, the U.S. EPA, Federal and State Trustees and the City of Sheboygan have been discussing the current and future uses of the Lower River and Inner Harbor. Based on these discussions and bathymetric surveys of the Inner Harbor developed by the USACE, some portions of the Inner Harbor contain unsafe navigational depth for some of the recreational vessels using the river and harbor. These vessels pose a substantial and imminent threat of PCB releases in the river.

The most contaminated sediments are currently buried under less contaminated sediment. The lack of safe navigational depth will result in the disturbance of these surface sediments exposing and the more contaminated sediment. To ensure the current and future use of the river, safe navigational dredging must be conducted. The safe navigational dredging mitigates the imminent and substantial threat of release of PCB contaminated sediments and is consistent with the Agency's initiatives on sustainable development and recycling of Superfund sites. Selecting no action for this stretch of navigational waterway, will result in the disturbance and resuspension of PCBs buried at depth. Institutional controls may be inadequate or unavailable to prevent this type of disturbance. The details of this alternative are being analyzed and the Proposed Plan will recommend an alternative consistent with this analysis.

**NRRB Comment #8**

The region and state should continue to discuss whether the PCB Ambient Water Quality Criterion for surface water is an ARAR for this action. If so, this ARAR may have significant impacts on the remediation goals to be attained, the remediation time frame, and/or the cost of the proposed actions. The board recommends that the region resolve this issue, and if it is determined to be an ARAR, describe in the proposed plan how and when the preferred alternative is expected to meet it.

**Region 5 Response to Comment #8**

The State of Wisconsin continues its assertion that the PCB Ambient Water Quality Criterion for surface water is an ARAR for this site. The water quality criterion standard controls point source discharges at operating facilities and may be relevant for the

purposes of establishing the quality of water for flora and fauna. However, the appropriateness of using a water quality standard for development of a sediment quality standard has not been officially approved oy EPA. The state has used the water quality criterion to calculate a sediment concentration threshold of 0.05 ppm based on the states equilibrium partiticning method. This-method for converting water concentrations to sediment concentrations has not been promulgated by the State and accepted by the EPA as an approved method for meeting water quality standards. Therefore, the current lack of an approved method for linking sediment concentrations to water concentrations results in the regional determination that Wisconsin's PCB Ambient Water Quality Criterion is a To-Be-Considered rather than an ARAR for this site at this time.